SAN ANTONIO

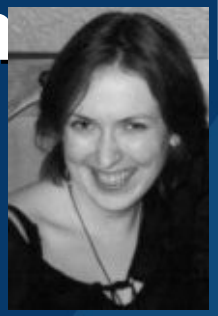
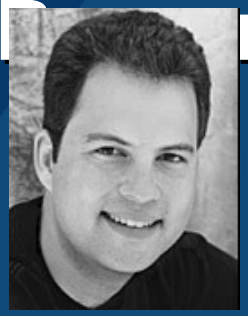
SIGGRAPH

2002

Recreating the Past

Alan Chalmers Kate Devlin

Paul Debevec Philippe Martinez

Quantifying Realism

Alan Chalmers

The need for realism

- Archaeological sites can be easily reconstructed on a computer
- Such “pretty pictures” can be misleading
- Quantifiable realism is *essential* if such reconstructions are to be useful tools for the archaeologist

Different fuel types

Modern lighting

Tallow candle

Olive oil

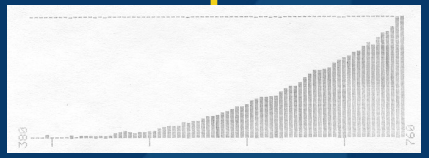
With salt

With water

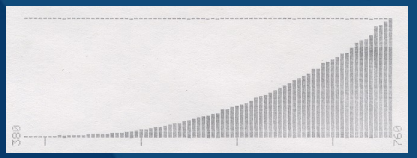
Ancient light sources

Realistic flame

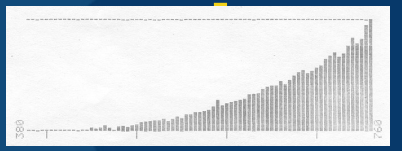
oi



oil+wat



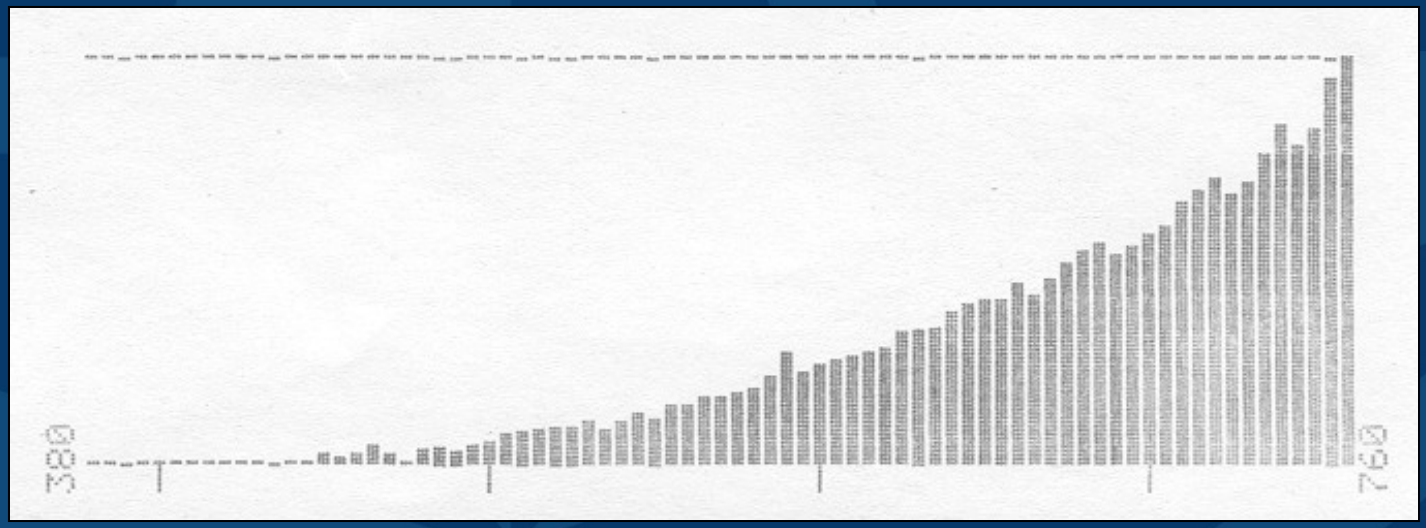
oil+s



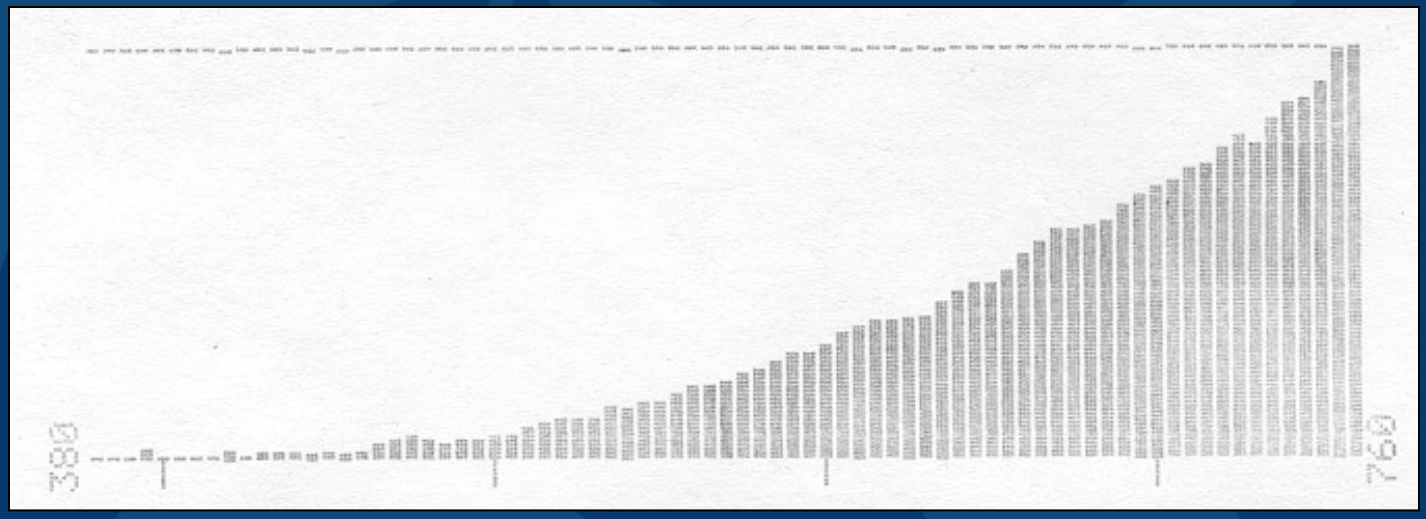
Spectral readings of different fuel types

Spectral properties

oil+salt



oil



Process

Original Image → Crop → Threshold → Sphere Data → Radiance Data Files

vide
o

Results

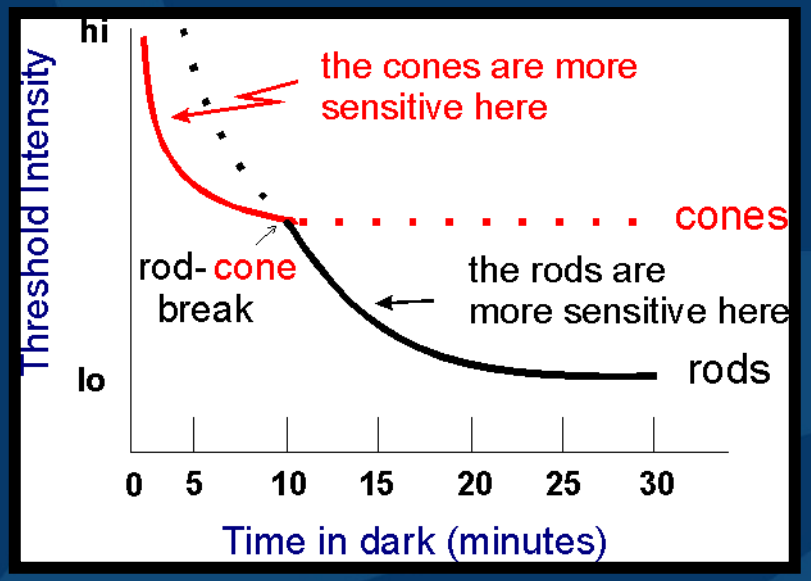
Turbulent flame

Validation

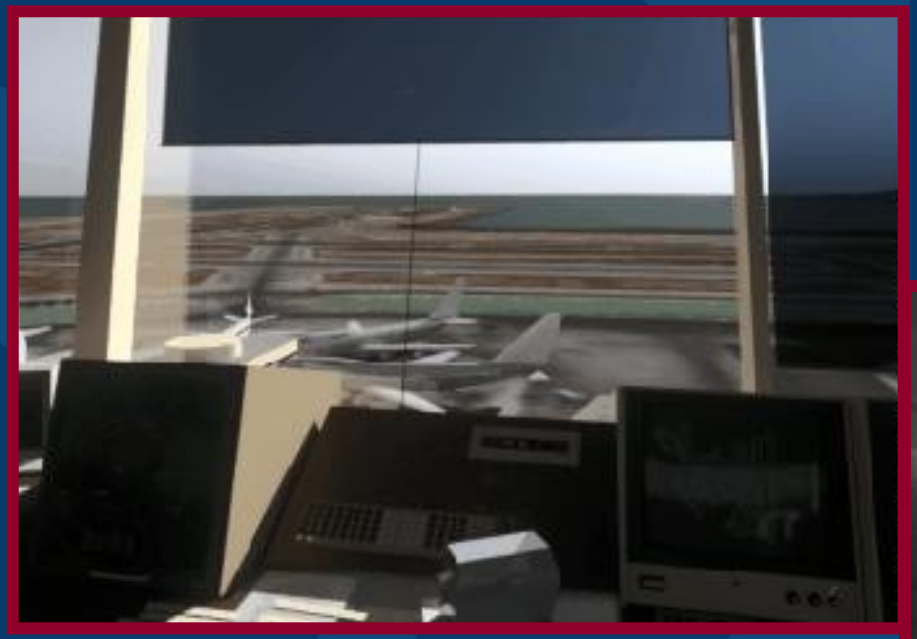
Ioannis Roussos

Visual Adaptation

Ferwerda et al, 1996



High Dynamic Range Scenes



Greg Ward et al.
1997

Image Quality

- **Why do we need high fidelity images?**
  - How do I know this image is real?

No absolute truths

- **For sites which no longer exist or have yet been built**
  - User must have confidence in the image

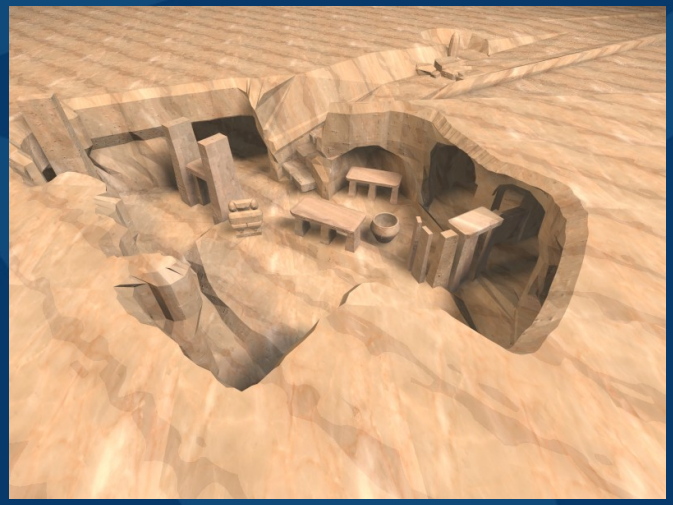


Photo-Realism vs High Fidelity

- **What is reality?**
  - Image synthesis techniques allow us to simulate accurately light distribution within a scene ⇒ does NOT imply high fidelity visual appearance

Problems

- **Lack of high fidelity due to:**
  - problems with modelling the scene
  - residual shortcomings of the rendering process
  - limited dynamic range of displays
  - extent to which human vision encodes such departures from perfect physical realism

Image Quality Metrics

- **Trying to provide quantitative data**
  - real vs photograph
  - real vs synthetic
  - photograph vs synthetic

MSE: 3297.343

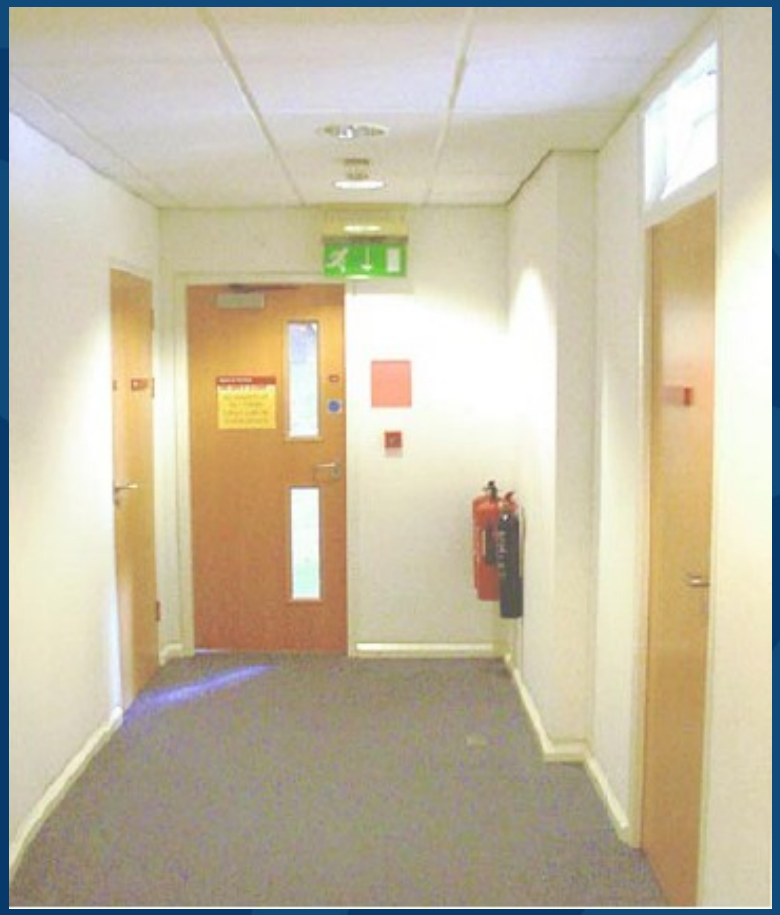
Realistic images

Patrick Ledda & Peter Longhurst

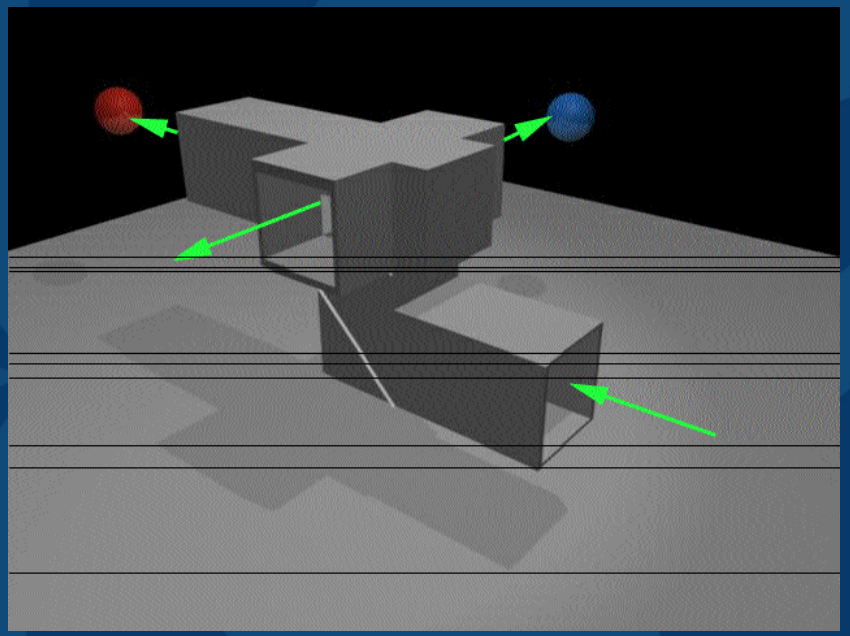
Scruffy textures

Level of scruffiness

Is a Photo more Real than Reality?

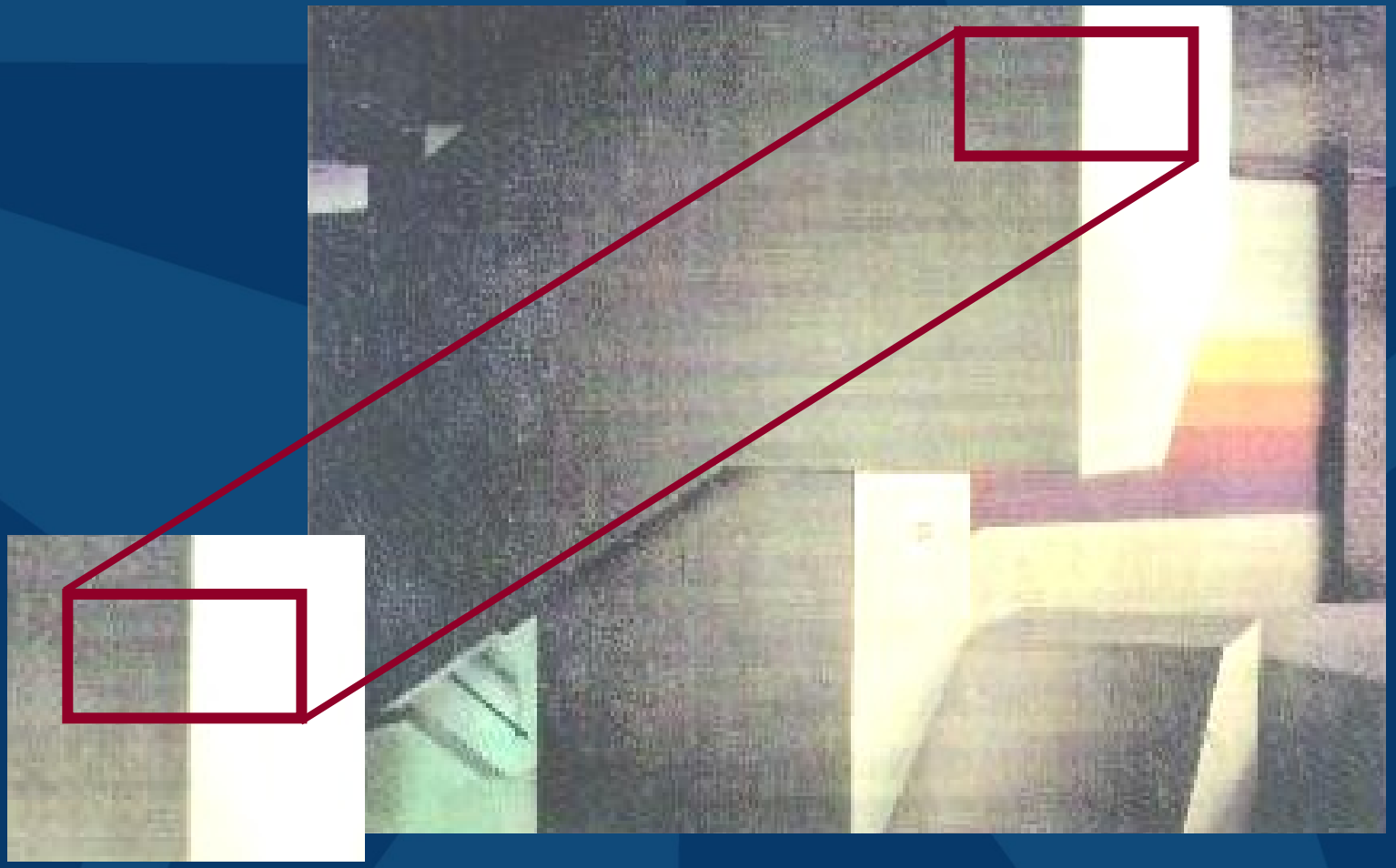


Calibrating *Believable* Reality



Lightness

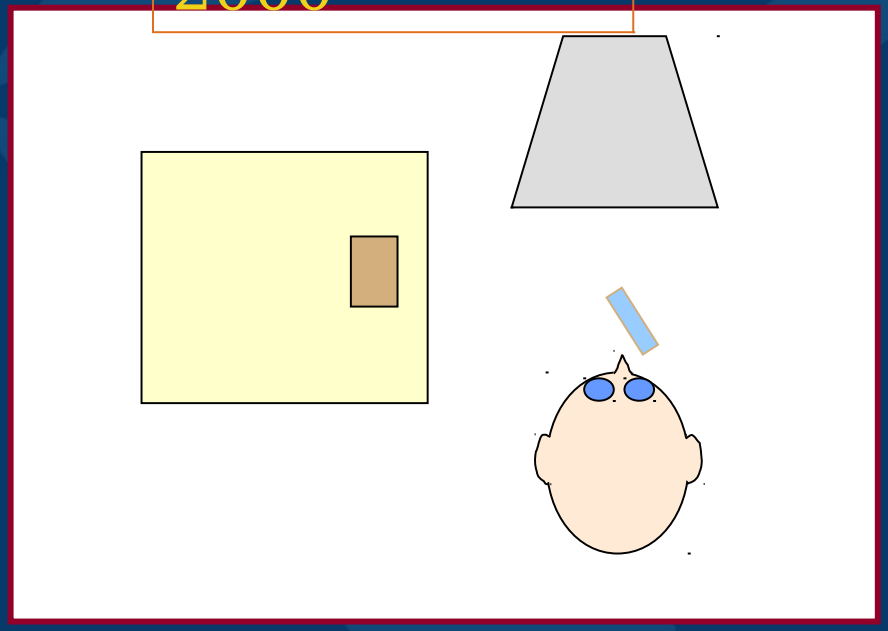
Gilchrist 1977

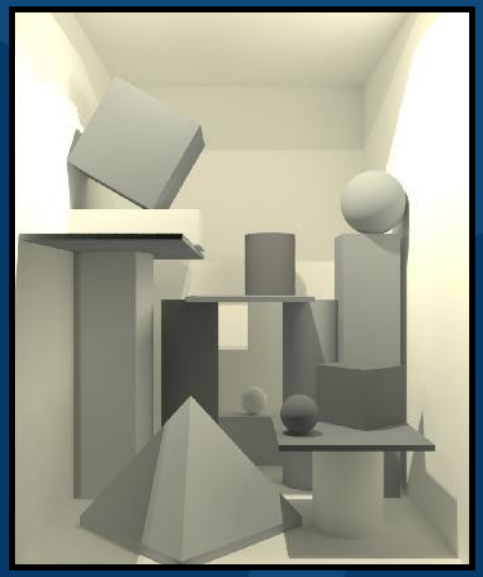


Psychophysics

Real Scene

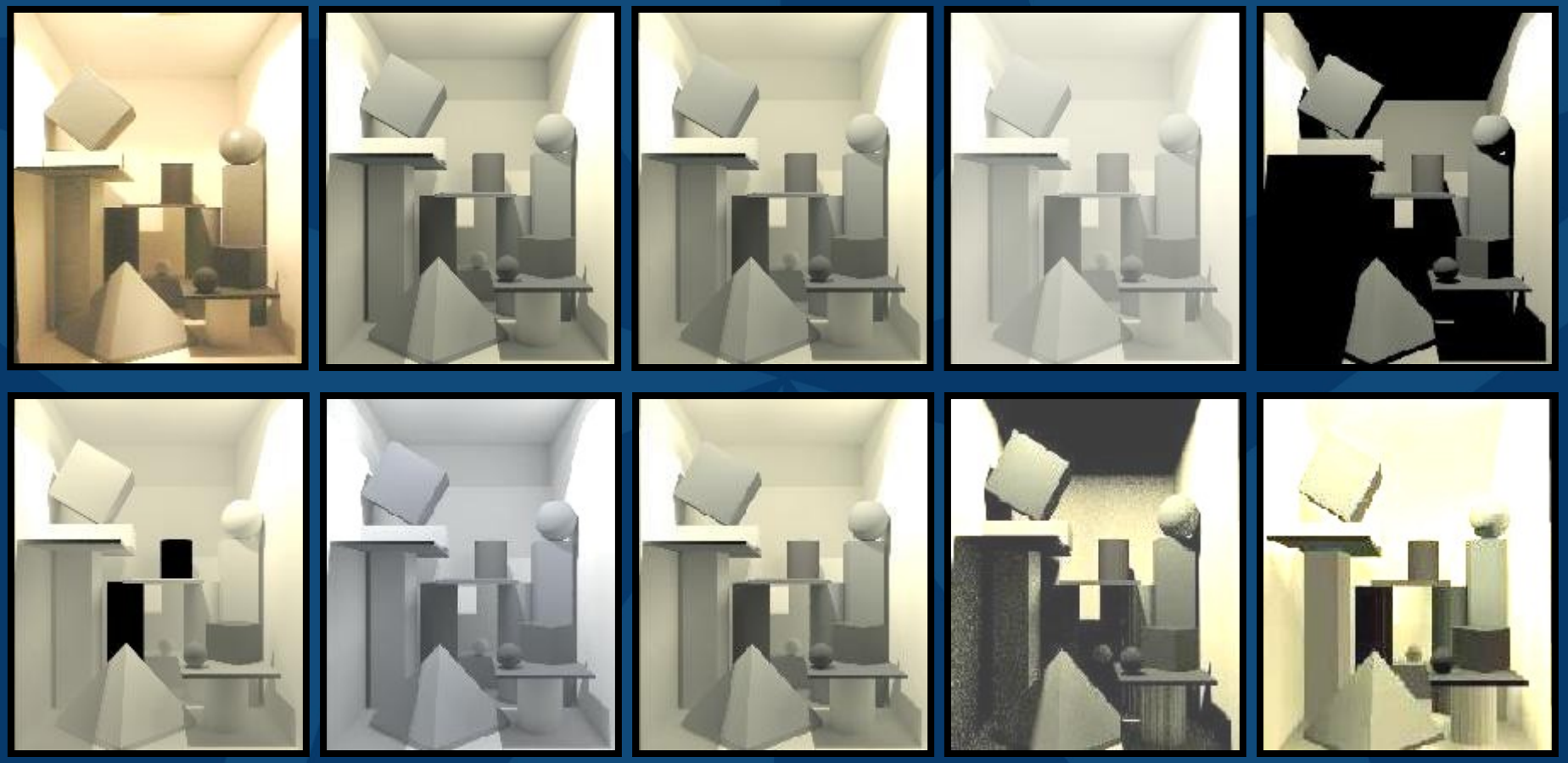
McNamara 2000



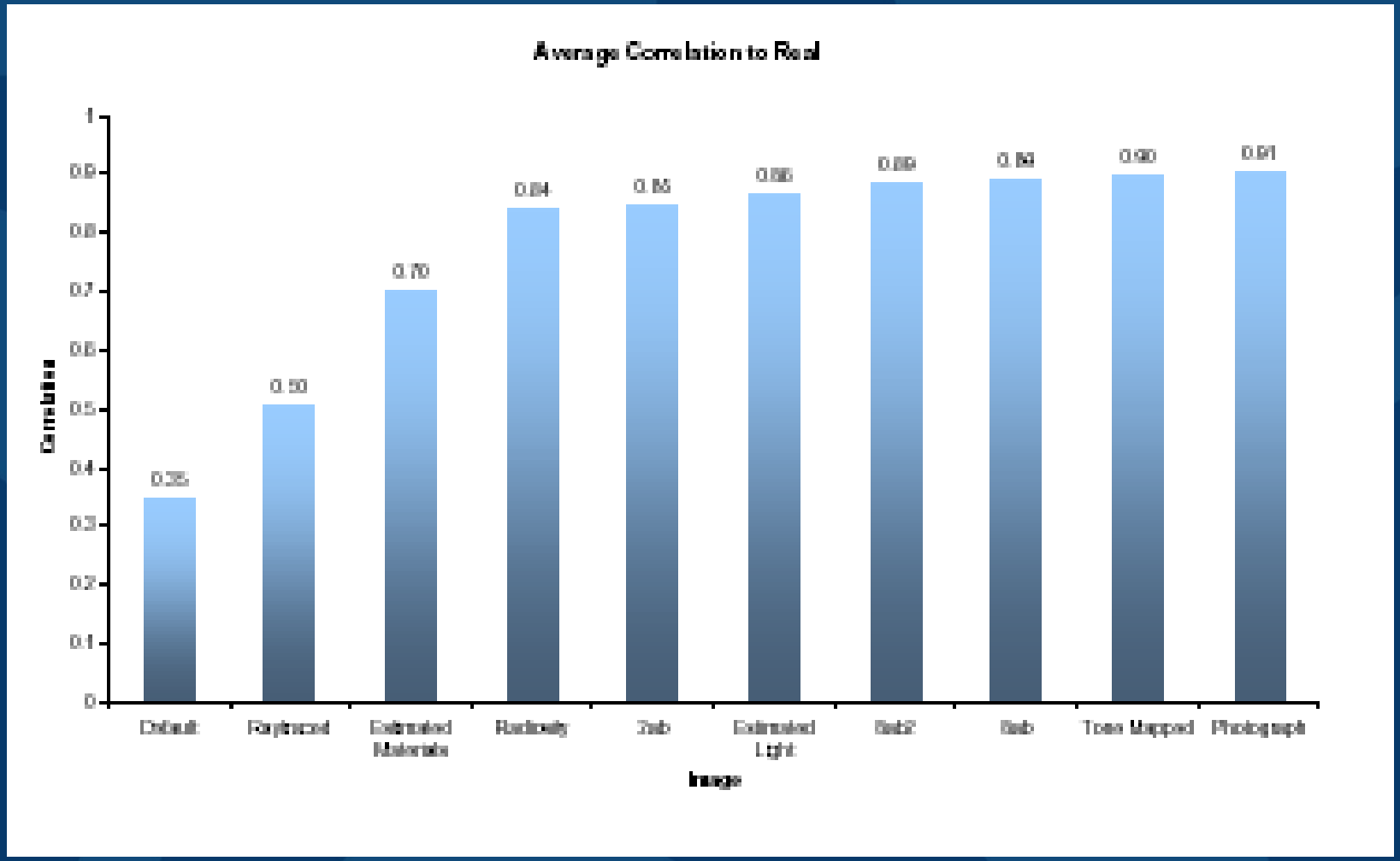


Rendered

Graphic Reconstructions



Quantifiable Realism



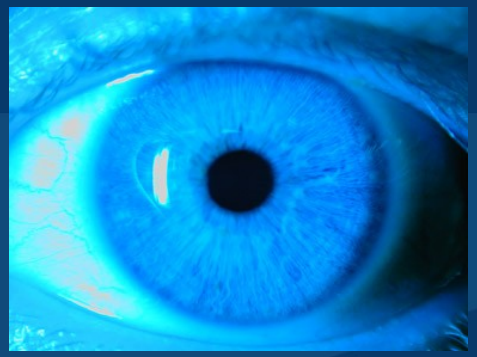
Perception of Art

Modern lighting

Candle Light

The Human Visual System

Kirsten Cater



- *Good but not perfect!*

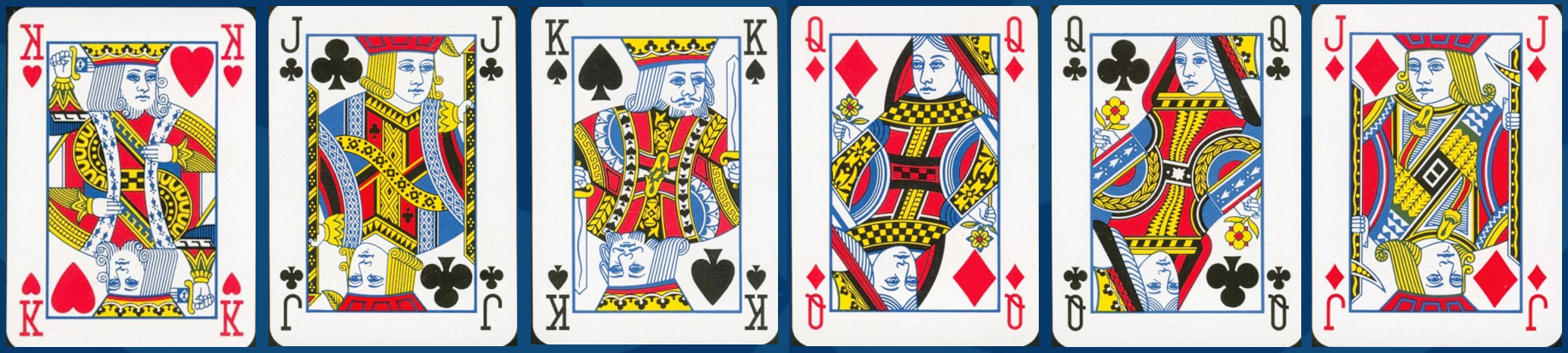
Flaws in the human visual system:

- Change Blindness
- Inattentional Blindness

Avoid wasting computational time

Magic trick to demonstrate Inattentional Blindness

- **Please choose one of the six cards below.**



Focus on that card you have chosen.

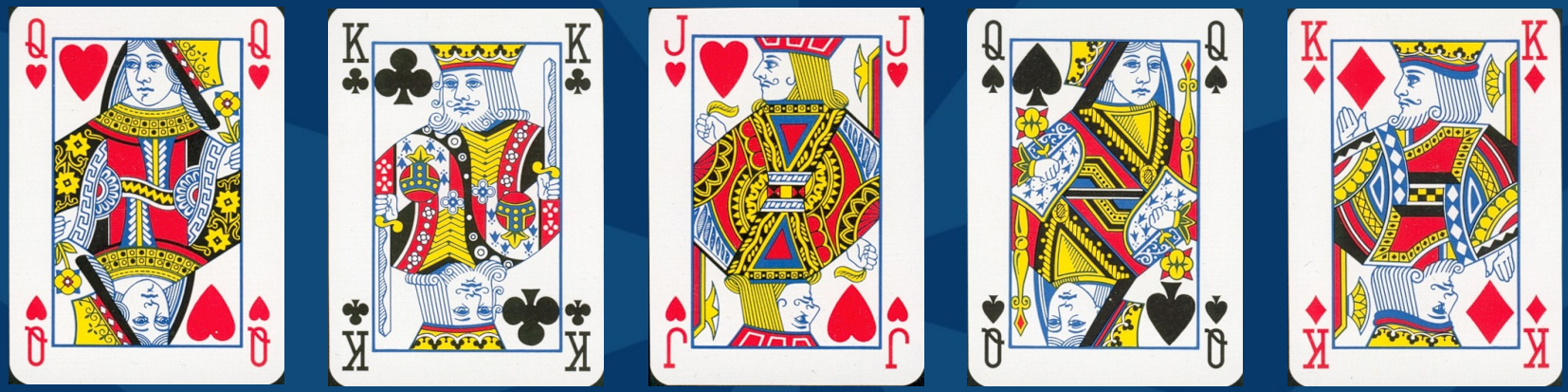
Magic trick (2)

- **I’ve shuffled the cards and removed the one which I think was your card.**

Can you still remember your card?

Magic trick (3)

- **Here are the remaining five cards, is your card there?**



Did I guess right? Or is it an illusion?

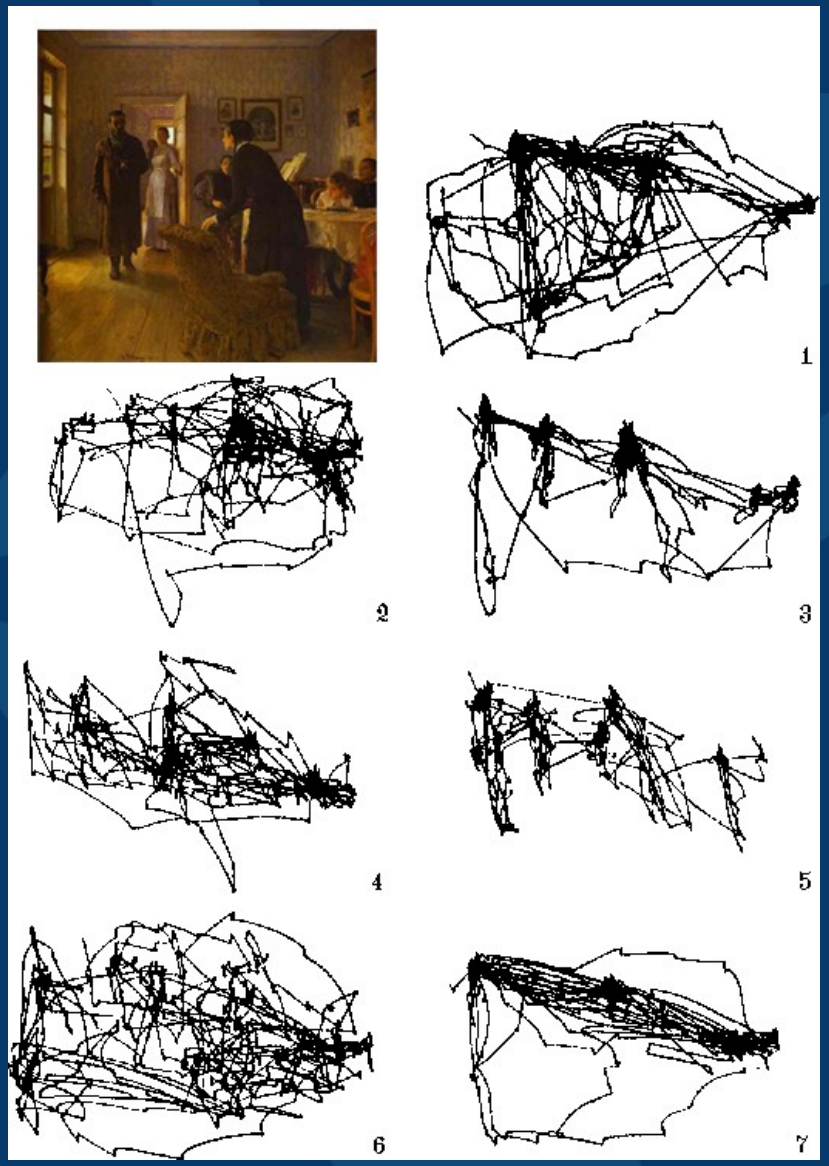
Magic trick - Explanation

- You just experienced ***Inattentional Blindness***
- ***None*** of the original six cards was displayed!

Tracking eye movements

- **Bottom up**
  - Saliency maps
- **Top down**
  - Inattentional blindness

Yarbus
1967



Putting it all togethe

Parallel Processing

Saliency maps

Inattentional blindness

Visual/audio perception

Model reduction

Task scheduling

Data management

Quantifiable realism

Perceptual Realism in Real-Time

Summary

It's all about Lighting!

- High fidelity reconstructions of *your* sites
- Unique wealth of display & research opportunities

- More details at:
  - www.archlight.co.uk
  - Email: Alan.Chalmers@bris.ac.uk

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